INTRODUCTION OF A SECTORAL APPROACH TO TRANSPORT SECTOR FOR POST-2012 CLIMATE REGIME

– A Preliminary Analysis Using Marginal Abatement Cost Curves –

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Recently, the concept of sectoral approaches has been discussed actively under the UNFCCC framework as it could realize GHG mitigations for the Kyoto Protocol and beyond. However, most studies have never introduced this approach to the transport sector explicitly or analyzed its impacts quantitatively. In this paper, we introduce a sectoral approach which aims to set sector-specific emission reduction targets for the transport sector for the post-2012 climate regime. We suppose that developed countries will commit to the sectoral reduction target and key developing countries such as China and India will have the sectoral no-lose targets—no penalties for the failure to meet targets but the right to sell exceeding reductions—for the medium term commitment, i.e. 2013-2020. Six scenarios of total CO_2 emission reduction target in the transport sector in 2020, varying from 5% to 30% reductions from the 2005 level are established. The paper preliminarily analyzes shares of emission reductions and abatement costs to meet the targets for key developed countries including the USA, EU-15, Russia, Japan and Canada. To analyze the impacts of the proposed approach, we generate sectoral marginal abatement cost (MAC) curves by region through extending a top-down economic model, namely the AIM/CGE model. The total emission reduction targets are analyzed against the developed MAC curves for the transport sector in order to obtain an equal marginal abatement cost which derives optimal emission reduction for each country and minimizes total abatement cost. The results indicate that the USA will play a crucial role in GHG mitigations in the transport sector as it is most responsible for emission reductions (i.e. accounts for more than 70%) while Japan will least reduce (i.e. accounts for about 3%) for all scenarios. In the case of a 5% reduction, the total abatement is equal to 171.1 $MtCO_2$ with a total cost of 1.61 billion USD; and in the case of a 30% reduction, the total abatement is equal to 1,026.4 $MtCO_2$ with a total cost of 116.17 billion USD. The emission reductions according to the total targets of the five developed regions could cover around 3% to 15% of global CO_2 emissions in the transport sector in 2020.

Key Words: Sectoral approach, Sectoral emission reduction target, Post-2012 climate regime, Marginal abatement cost curve, Transport sector

1. INTRODUCTION

Recently, the concept of sectoral approaches is the most discussed under the United Nations Framework Convention on Climate Change (UNFCCC) due to expectations that it could bring fair emission reduction targets setting and facilitate developed countries to meeting their targets through aggregating sectoral emission reduction potentials[1]. At present, there are several ideas to introduce a sectoral approach for the post-2012 climate mitigation regime. However, most proposals have never discussed the way to introduce this approach to the transport sector explicitly or how to analyze its impacts quantitatively. One of the possible sectoral approaches that could tackle sectors with rapidly rising emissions and significant risk of lock-in, like the transport sector, is to set sector-specific emission reduction targets.

The transport sector accounts for a quarter of global carbon dioxide (CO_2) emissions with a rapidly growing rate[2]. There is no significant sign of emission mitigations in the transport sector to date, even though the Kyoto Protocol has already entered into force—only two regis-

tered CDM (i.e. Clean Development Mechanism) projects and not one JI (i.e. Joint Implementation) project in the transport sector (as of 1 June 2009)[3]. Furthermore, the transport sector only plays a minor role in the current negotiations. The transport sector needs preferential support for policies and measures that reduce greenhouse gas (GHG) emissions and have co-benefit or other sustainable objectives, such as reductions in air pollution, noise, and congestion[4].

This paper aims to introduce a sectoral approach in order to curb CO_2 emissions especially from transportation by introducing sectoral emission reduction targets in the transport sector for the post-2012 climate regime. We suppose that CO_2 emission reduction targets in the transport sector are assigned for key developed countries including USA, EU-15 (i.e. the States who were EU members in 1990), Russia, Japan and Canada which emits over 60% of global CO_2 emissions in transport sector in 2005. Furthermore, in order to assess the potential of the proposed sectoral approach, we employ a global computable general equilibrium (CGE) model namely AIM/CGE model to generate marginal abatement cost (MAC) curves for the transport sector by region. The total emission reduction targets in the transport sector for the committed countries will be analyzed against the developed MAC curves for the transport sector in order to obtain an equal marginal abatement cost which results in optimal emission reduction for each country that minimizes total abatement cost.

2. SECTORAL APPROACHES

The concept of sectoral approaches is actually included in Article 4.1 (c) of the 1992 UNFCCC which requires governments to *'promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic greenhouse gases emissions in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors'*. Later, the concept of the sectoral approach was embedded in the Kyoto Protocol to the UNFCCC which the sectors and energy sources are defined in Annex A. Further, paragraph 1 (b) (iv) of the Bali Action Plan notes *'cooperative sectoral approaches and sector-specific actions'* in order to enhance implementation of Article 4.1 (c) of the Convention. However, there is confusion and concern around the concept of sectoral approaches—their exact specification is often unclear[5,6].

To follow the Bali Road Map which aims to complete negotiations by 2009 at the Conference of the Parties in Copenhagen (COP15), sectoral approaches have been proposed and discussed actively under both the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) and the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA). At the 3rd Session of the AWG-LCA, several governments have proposed principles, definitions and concepts of sectoral approaches. Among the proponents of sectoral approaches, the Japanese Government is the most active and has its own sectoral approach which basically aims to set midterm national targets for each major emitting country (including China and India) by calculating the emission reduction potential in each sector, such as power-generation, transport, and others with certain indicators. Japan has also promoted a sectoral approach outside the UNFCCC process at the G8 Environment Ministers Meeting in Kobe and at the G8 Submit in Hokkaido. The G8 stated that the sectoral approach proposed by Japan is recognized as a useful tool for achieving national emission reduction goals.

There are two main concepts of sectoral approaches according to commitment periods of the climate regime. The earlier sectoral-based concepts aim to refine the CDM under the Kyoto Protocol[5,6]. The latter concepts of sectoral approaches are proposals for post-2012 international climate agreements[7,8] which are elaborated in this paper. The definitions of sectoral approaches for the post-2012 climate mitigation regime can be summarized as follows. Firstly, sectoral approaches can be used to analyze GHG emission reduction potential by sectors and can be useful tools for setting a fair emission reduction target for each country. A country can apply the sectoral approach to assemble sector-based mitigation potentials to contribute to the estimation of a quantified national emission reduction target. Secondly, the sectoral approach might mean a sector-wide transnational agreement which aims to engage a sector on a broad international basis or a global sectoral industry approach. It can be also applied to identify the best practices and technologies for each sector and policy measures and encourages transfer of the practices through public-private cooperation according to energy efficiency and technology diffusion rate in each country. For example, countries might agree to establish a long-term emission reduction goal, fuel economy standards for vehicles, low-carbon standards for fuels, and a cooperative program to develop alternative technologies[9]. Alternatively, the sectoral emission cap can be imposed to major developing countries in the near future